BEFORE THE PUBLIC SERVICE COMMISSION OF SOUTH CAROLINA

DOCKET NO. 2018-318-E

In the Matter of:	)	
	)	**DIRECT TESTIMONY OF**
Application of Duke Energy Progress, LLC	)	**KELVIN HENDERSON**
for Adjustments in Electric Rate Schedules	)	**FOR DUKE ENERGY**
and Tariffs	)	**PROGRESS, LLC**

I. INTRODUCTION AND OVERVIEW

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Kelvin Henderson and my business address is 526 South Church Street, Charlotte, North Carolina.

Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A. I am Senior Vice President of Nuclear Operations for Duke Energy Corporation ("Duke Energy"), with direct executive accountability for Duke Energy's North Carolina nuclear stations, including Duke Energy Progress, LLC's ("DE Progress" or the "Company") Brunswick Nuclear Station ("Brunswick") in Brunswick County, North Carolina; the Harris Nuclear Station ("Harris") in Wake County, North Carolina; and Duke Energy Carolinas, LLC's ("DE Carolinas") McGuire Nuclear Station, located in Mecklenburg County, North Carolina.

Q. WHAT ARE YOUR RESPONSIBILITIES AS SENIOR VICE PRESIDENT OF NUCLEAR OPERATIONS?

A. As Senior Vice President of Nuclear Operations, I am responsible for providing oversight for the safe and reliable operation of Duke Energy's nuclear stations in North Carolina. I am also involved in the operations of Duke Energy's other nuclear stations, including DE Progress's Robinson Nuclear Station ("Robinson"), located in Darlington County, South Carolina.

Q. PLEASE SUMMARIZE YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL EXPERIENCE.

A. I have a Bachelor's degree in Mechanical Engineering from Bradley University and over 26 years of nuclear energy experience with increasing responsibilities. My nuclear career began at Commonwealth Edison's Zion Nuclear Station in Illinois where I received a senior reactor operator license from the Nuclear Regulatory Commission ("NRC") and served as a control room unit supervisor. In 1998, I joined Progress Energy in the operations department at the Harris Nuclear Station. After serving in various leadership roles in Operations, Work Management, and Maintenance, I was named plant manager at Harris. In 2011, I was named general manager of nuclear fleet operations for Progress Energy. Following the merger between Duke Energy and Progress Energy, Inc. in 2012, I became site vice president of DE Carolina's Catawba Nuclear Station in York County, South Carolina. In 2016, I was named senior vice president of corporate nuclear, and I assumed my current role as senior vice president of Nuclear Operations in December 2017.

Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THIS COMMISSION?

A. Yes. I testified before this Commission in DE Progress' 2018 annual fuel proceeding in Docket No. 2018-1-E.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. The purpose of my testimony is to provide information in support of the Company's request for a base rate adjustment. To this end, I describe DE Progress' nuclear generation assets; update the Commission on capital additions since the Company's last rate case filed in 2016, Docket No. 2016-227-E (the "2016 Rate Case"); provide a high-level view of capital additions planned for the upcoming years; explain key drivers impacting nuclear operations and maintenance ("O&M") costs and provide operational performance results for calendar year 2017 (the "Test Period").

Q. WHAT ARE THE PRIMARY CAPITAL AND O&M DRIVERS WITHIN THE NUCLEAR FLEET DRIVING THIS REQUEST?

A. Capital investments have increased since the 2016 Rate Case. For example, investments necessary to meet requirements of the NRC near-term priorities stemming from Fukushima,[1] including EA-12-049, "Order to Modify Licenses with regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," and EA-12-051, "Order Modifying Licenses with regard to Reliable Spent Fuel Pool Instrumentation" were made. All three stations implemented modifications to provide protection of critical digital assets, and transmission line open phase detection system upgrades have been

[1] Industry reference to the March 2011 earthquake and tsunami in Japan, which resulted in damage to the Fukushima Daiichi Nuclear Power Station.

installed at Brunswick and Harris and are scheduled to complete at Robinson during the fall 2018 refueling outage. These projects enhance safety margins related to offsite power. Other capital projects addressed aging management and reliability enhancements to key systems.

Since the 2016 Rate Case, O&M expense has declined slightly. DE Progress has managed O&M challenges driven primarily from inflationary pressure on labor and materials. The Company continues to make every effort to control costs and effectively maximize cost efficiency. For example, the Company undertook an effort to more effectively utilize contingent workers supporting refueling outages resulting in a decrease in outage costs, deployed a data analytics tool to improve monitoring and tracking of worker deployment, tenure and release, and streamlined the in-processing activities at the centralized King's Mountain facility achieving a notable reduction in the time required to process incoming workers. The Company continues to look for efficiencies in organizational structure and innovation. However, despite these aggressive and significant efforts, DE Progress continues to face new costs and inflationary pressures.

Q. HOW IS THE REMAINDER OF YOUR TESTIMONY ORGANIZED?

A. The remainder of my testimony is organized as follows:

II. NUCLEAR FLEET: Generation Capacity and Asset Descriptions

III. CAPITAL ADDITIONS: In-Service for This Proceeding

IV. FORWARD VIEW OF CAPITAL ADDITIONS

V. O&M AND OTHER ADJUSTMENTS

VI. NUCLEAR OPERATIONAL PERFORMANCE: Metrics and Industry Benchmarking

VII. CONCLUSION

II. NUCLEAR FLEET

Q. PLEASE LIST DE PROGRESS' NUCLEAR FLEET.

A. The Company's nuclear generation portfolio consists of 3,543 megawatts ("MWs") of power capacity made up as follows:

Brunswick - 1,870 MWs

Harris - 932 MWs

Robinson - 741 MWs

Q. PLEASE GENERALLY DESCRIBE DE PROGRESS' NUCLEAR GENERATION ASSETS.

A. DE Progress' nuclear fleet consists of three generating stations and a total of four units. Brunswick is a boiling water reactor facility with two units and was the first nuclear plant built in North Carolina. Unit 2 began commercial operation in 1975, followed by Unit 1 in 1977. The operating licenses for Brunswick were renewed in June 2006 by the NRC, extending operations up to 2036 and 2034 for Units 1 and 2, respectively. Harris is a single unit pressurized water reactor that began commercial operation in 1987. The NRC issued a renewed license for Harris in 2008, extending operations up to 2046. Robinson, also a single unit pressurized water reactor, began commercial

operation in 1971. The license renewal for Robinson Unit 2 was issued by the NRC in 2004, extending operation for Robinson up to 2030.

Q. WERE THERE ANY POWER CAPACITY CHANGES WITHIN DE PROGRESS' NUCLEAR PORTFOLIO SINCE THE LAST RATE CASE?

A. Yes. During the fall 2016 refueling outage at Harris, the Company replaced Moisture Separator Reheaters ("MSRs"). The aged MSRs were replaced with more efficient models, increasing capacity by 4 MWs in the summer and 7 MWs during winter months. The plant's Maximum Dependable Capacity ("MDC") was revised effective January 1, 2018 reflecting the increase.

III. CAPITAL ADDITIONS

Q. PLEASE PROVIDE ADDITIONAL DETAILS REGARDING MAJOR CAPITAL PROJECTS FOR NUCLEAR BEING INCLUDED IN THIS CASE.

A. Since the 2016 Rate Case, DE Progress has invested approximately $1.5 billion in beneficial capital projects, from September 1, 2016 through December 2018. These capital improvements were required to enhance safety, preserve performance and reliability of the plants throughout their extended life operations, and to address regulatory requirements. For example, all three DE Progress stations have, or are in the process of upgrading turbine control systems ("TCS"). The fleet based TCS project addresses equipment obsolescence and single-point vulnerabilities. The TCS

project has been implemented on Brunswick Unit 1 and Harris. Robinson is implementing the TCS project during the fall 2018 refueling outage. As I mentioned earlier, to comply with NEI 13-12, *Open Phase Condition Industry Guidance Document*, and NRC Bulletin 2012-01, the Company has completed open phase detection system upgrades at Brunswick and Harris, and expects to complete upgrades at Robinson by year-end 2018. The system provides a fully redundant open phase protection system, thus improving safety margins related to offsite power.

At Brunswick, capital investments have been made to improve the safety and reliability of the emergency diesel generators ("EDGs"). The multi-year project, designed to resolve aging and obsolescence issues, involved the installation of new automatic voltage regulators and governors. This work has completed on all four EDGs. Similarly, projects to remediate and replace portions of the saltwater containing systems, including replacements of both service water and circulating water pumps is continuing. To date, three service water pumps and four circulating pumps have been replaced. The new pumps are designed to better withstand the corrosive effects of the saltwater environment, improving equipment reliability and reducing long-term operating and maintenance costs. Another phase of the project involved chlorination improvements to enhance long-term reliable operation of service water and circulating water systems. The chlorination phase of the project completed in the spring of 2017. Finally, the majority of

capital investments necessary for compliance with the NRC's near-term requirements related to Fukushima have been completed. Requirements contained in a separate order, specific only to GE boiling water reactors like Brunswick, are complete on Unit 1. Studies remain ongoing post-Fukushima that could require additional capital investments in the future.

At Harris, projects improving the reliability and serviceability of the site electrical distribution system completed in 2017. The multi-year project replaced more than 300 480-V breakers and breaker cubicle enclosures. Existing degraded and obsolete cubicles that lacked spare parts were replaced with new cubicles manufactured to the same size, fit and function. Replacement of the station's low-pressure turbine, addressed the aging of the existing turbine and mitigated the free-standing blade root cracking concerns. The new turbine also improves thermal efficiency, and is expected to increase the station's capacity by 30 to 35 MWs. Once testing and validation concludes in 2018, the station expects to restate MDC effective January 1, 2019 to capture the increase. Regulatory related projects, including all near-term requirements stemming from Fukushima, and cyber security are complete.

At Robinson, the main generator stator replacement improved reliability and efficiencies of the generator, and reduced maintenance and inspection efforts. The replacement of both low-pressure turbines, completing in the fall 2018 refueling outage, addresses blade design issues that have

resulted in reliability challenges. Transmission upgrades are also being implemented during the fall 2018 refueling outage to provide a second source of off-site power and to improve reliability of the station's electrical distribution and protective relaying systems of major plant components. The project will install a second 230 kV start-up transformer and replace the existing 115 kV start-up transformer with an upgraded unit containing an automatic load tap charger. Near term requirements stemming from Fukushima were completed, and all modifications related to current cyber security requirements are complete

Q. MR. HENDERSON, ARE THE CAPITAL ADDITIONS AND ENHANCEMENTS YOU HAVE DESCRIBED IN YOUR TESTIMONY USED AND USEFUL IN PROVIDING ELECTRIC SERVICE TO DE PROGRESS' ELECTRIC CUSTOMERS IN SOUTH CAROLINA?

A. Yes. They are used and useful in safely and efficiently providing reliable electric service to the Company's customers. Because of the Company's successful efforts to renew the licenses, refurbish obsolete equipment and systems, and enhance safety margins in compliance with new NRC requirements, and increase output and capacity, customers will continue to benefit from the power provided by this reliable, efficient, cost-effective and greenhouse gas emissions-free, 24/7 power source of energy for many years to come. These investments have positioned the Company to maintain high

levels of operational safety, efficiency, reliability and performance that is reflected in the nuclear performance results I discuss later in my testimony.

Q. HAS THE COMPANY ATTEMPTED TO LIMIT COST INCREASES FOR CAPITAL ADDITIONS AND O&M EXPENSES?

A. Yes. The Company controls costs for capital projects and O&M utilizing a rigorous cost management program. The Company sustainably controls costs through routine executive oversight of project budget and activity reporting, with new projects requiring approval by progressively higher levels of management depending on total project cost. The Company controls ongoing capital and O&M costs through strategic planning and procurement; efficient oversight of contractors by a trained and experienced workforce; rigorous monitoring of work quality; thorough critiques to drive out process improvement; and industry benchmarking to ensure best practices are being utilized.

In December 2015, the U.S. nuclear industry launched a multi-year initiative entitled "Delivering the Nuclear Promise," to enable U.S. nuclear power plants to strengthen safety, increase efficiency, and reduce cost. The Company has fully engaged with industry peers to identify and implement opportunities. However, despite these considerable efforts DE Progress continues to face new costs and inflationary pressures.

IV. FORWARD VIEW OF CAPITAL ADDITIONS

Q. WHAT TYPES OF PROJECTS ARE IN THE CAPITAL BUDGET FOR NUCLEAR OPERATIONS FOR THE NEAR FUTURE?

A. Over the next three years, 2019-2021, DE Progress plans to incur approximately $497 million in capital expenditures to continue addressing safety enhancements, equipment reliability, performance and aging, and regulatory commitments.

Brunswick is scheduled to complete additional work related to saltwater systems, including the replacement of additional service water and circulating water pumps. Based on the current project schedules, service water pump replacements will complete in 2022 and circulating pump replacements are scheduled to complete in 2023. At the conclusion of the project, 18 pumps will have been replaced with the upgraded models. The final remaining phase of the multi-year alternative decay heat removal system projects are scheduled to complete in 2019 and be available for the spring 2020 refueling outage. This project enhances safety and reliability, and provides outage scheduling benefits. In addition, the multi-phase project to replace feedwater heaters and upgrade associated components is currently scheduled to complete in 2019. These feedwater heater replacements will improve system performance, availability and reliability. Reactor recirculation pump seal replacements will continue, and are designed to improve a long-standing reliability challenge. Post-Fukushima regulatory requirements,

applicable only to boiling water reactors, will be completed on Unit 2 in spring 2019. Unit 1 work completed in 2018.

Planned Harris projects include replacement of the reactor vessel head to resolve the susceptibility of stress corrosion cracking and required repair and inspection work. Upgrades of the essential services chilled water chillers will improve the reliability of the existing safety-related chillers, as well as provide additional non-safety chillers to assume most day-to-day demand of the safety-related chillers. This will enable extended safety-related chiller life by limiting their service to periodic surveillances and required safety functions. The Company plans to commission the "D" spent fuel pool to cost effectively expand the wet storage capacity for the station's spent fuel. The "D" pool was installed during the initial construction of the plant but has not been used to store spent fuel. New racks are scheduled to be installed in the spring of 2019, efficiently expanding the station's spent fuel storage capabilities.

Investments at Robinson, similar to Brunswick and Harris, will focus on aging management and maintaining the station for continued operation. Examples of projects planned for the next few years at Robinson include the addition of 10 dry cask spent fuel storage units. The additional casks are expected to be certified and in-service by 2020, expanding the station's capacity for spent fuel storage. Refurbishment of both the east and west tainter gates is also planned, and expected to complete by 2021. The tainter

gates are required to maintain proper lake levels. The project will replace degraded seals and address corrosion to ensure the integrity of the gates is maintained.

Additional requirements for U.S. nuclear facilities are uncertain; however, developing and deploying any needed long-term corrective actions may necessitate capital and/or O&M investment over and above the current budget.

V. O&M AND OTHER ADJUSTMENTS

Q. PLEASE DESCRIBE SIGNIFICANT COST DRIVERS IMPACTING O&M EXPENSES FOR DE PROGRESS' NUCLEAR FLEET.

A. During the Test Period, approximately 28 percent of the required O&M expenditures for DE Progress' nuclear fleet were fuel-related. A complete discussion of nuclear fuel costs can be found in Witness Houston's testimony filed with this Commission on April 27, 2018 in the Company's annual fuel proceeding in Docket No. 2018-1-E. In his testimony, Witness Houston noted that the Company anticipates a modest decrease in nuclear fuel costs on a cents per kilowatt hour ("kWh") basis through the next several years. Customers will continue to benefit from the Company's diverse energy mix and the strong performance of its nuclear fleet through lower fuel costs than would otherwise result absent the significant contribution of nuclear power to meeting customers' demands.

Non-fuel items comprise the remainder of O&M expenditures for the nuclear fleet. Nuclear power plant operations are very labor intensive and therefore, a significant portion of O&M expenses are related to internal and contracted labor. The Company continues to face upward pressure on these ongoing labor costs and other challenges have occurred with rising costs for materials and supplies.

Q. WHAT EXAMPLES CAN YOU PROVIDE RELATED TO THE COMPANY'S EFFORTS TO CONTROL O&M COSTS AS NOTED ABOVE?

A. The Company has many efforts in place for controlling and/or saving costs. An area of focus in recent years has been outage optimization, focusing on duration, budget, dose, and production. This approach applies strict controls on reducing outage durations aligning typical maintenance work within duration templates, allocating costs based on duration templates, improving alignment of bulk work to minimize schedule impacts, and targeting dose to the five-year ALARA[2] plan.

In 2017, the Nuclear Energy Institute ("NEI") recognized the Company's efforts in three initiatives with Top Industry Practices ("TIP") awards; Utilization of FLEX Equipment, Core Shroud Inspections, and Procurement Engineering Prioritization.

[2] Code of Federal Regulations (10 CFR 20.1003) acronym for "as low as (is) reasonably achievable."

The Utilization of FLEX Equipment initiative was developed by the Harris team, and allowed the plant to amend its operating license to allow the utilization of FLEX equipment to extend the time for Emergency Service Water ("ESW") pump replacement at full power. As a result, the ESW pump was replaced while the unit was on-line, saving approximately 5 days of outage time, and the challenges that would have resulted from significant changes in the outage schedule. Even more significant, utilization of the FLEX equipment to facilitate on-line ESW pump replacement increased safety. This Harris initiative is an early example that demonstrates the ability of the industry to use existing FLEX equipment to improve operational flexibility, improve safety margins and reduce costs. The Harris effort will continue to benefit the Company and others in the industry.

Brunswick partnered with AREVA to develop a new ultrasonic technique and remote tooling to facilitate required periodic shroud inspections. The new technique and tooling was deployed in the spring 2016 refueling outage saving approximately $130 thousand during the outage, and will provide for approximately $1.8 million in cost avoidance through 2020.

The Company's nuclear procurement engineering organization developed the Procurement Engineering Prioritization, Reporting, and Obsolescence ("PE PRO") application. In addition, a Quality Receipt Inspector ("QRI") application was developed. Both applications were implemented fleet-wide in March 2016, facilitating the prioritization and

tracking of real-time priorities requiring support of the Fleet Procurement Engineering and Quality Receipt Inspector organizations. These applications increase nuclear safety by ensuring Procurement Engineering and Quality Receipt activities are correctly prioritized to support critical work activities and schedules.

Q. PLEASE DESCRIBE THE NRC REQUIREMENTS COMMUNICATED TO DATE WITH RESPECT TO FUKUSHIMA.

A. The NRC established regulatory requirements for the nation's operating reactors to address actions prioritized as "Tier One" by the NRC based upon its "Near-Term Task Force Review of Insights from the Fukushima Daiichi Accident." Specifically, on March 12, 2012, the NRC issued reactor licensees three orders[3] and a multifaceted letter request for information and actions under 10 CFR 50.54(f). The orders, effective immediately, require the Company to implement safety enhancements related to (1) mitigation strategies to respond to extreme natural events resulting in the loss of power at plants and (2) enhancing spent fuel pool instrumentation.

The 10 CFR 50.54(f) letter required (i) a re-evaluation of seismic hazards and associated risks and description of any resulting mitigation actions, (ii) plant walk downs to assess seismic vulnerabilities, (iii) a flood

[3] See EA-12-049 "Order to Modify Licenses with regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events;" EA-12-050 "Order to Modify Licenses with regard to Reliable Hardened Containment Vents;" and EA-12-051 "Order Modifying Licenses with regard to Reliable Spent Fuel Pool Instrumentation."

hazard re-evaluation and description of any resulting mitigation actions, (iv) flood protection walk downs to assess flooding vulnerabilities, (v) an assessment of emergency communications equipment, and (vi) an assessment of the adequacy of plant staffing to address large scale natural events. DE Progress, along with the other nuclear power reactor licensees, was required to promptly begin implementation of the safety enhancements and complete implementation within two refueling outages or by December 31, 2016, whichever occurred first.

Q. WHAT IS THE COMPANY'S CURRENT STATUS WITH RESPECT TO COMPLIANCE WITH THE NRC REQUIREMENTS RELATED TO FUKUSHIMA?

A. DE Progress promptly engaged in efforts to address the requirements with design and implementation of various diverse and flexible ("FLEX") coping strategies to address issues like the loss of emergency power and temporary physical isolation of the site, a key focus of the near-term efforts. In addition, efforts included installation of reliable instrumentation in place at each nuclear site to monitor spent fuel pool water levels and effectively prioritize any emergency activities that may be required. As of April 2016, all four DE Progress units had completed implementation of the FLEX and spent fuel pool level instrumentation orders. Solid progress has been made to complete the remaining Tier 1 work, which includes analyses to better understand how natural phenomena events such as earthquakes and flooding could impact our

plants. Tier 1 efforts are planned for completion within the next two to three years.

Q. ARE THERE ADDITIONAL REQUIREMENTS SPECIFIC TO THE BOILING WATER REACTOR UNITS AT BRUNSWICK?

A. Yes, the NRC Order Number EA-13-109, "Order to Modify Licenses with Regard to Reliable Hardened Containment Vents ("HCV") Capable of Operation Under Severe Accident Conditions" is in progress. Collaborative discussions between Duke Energy, the NEI and the NRC established the required scope of work for full compliance with the order. Unit 1 related work was completed during the spring 2018 refueling outage and Unit 2 work is scheduled to complete during the spring 2019 refueling outage.

Q. PLEASE DESCRIBE THE NRC REQUIREMENTS COMMUNICATED TO DATE WITH RESPECT TO CYBER SECURITY.

A. In 2009, the NRC published regulations requiring[4] that licensees protect digital assets associated with and important to, safety, security and emergency preparedness functions. The NEI worked with the NRC and industry representatives (including Duke Energy) to develop NEI 08-09, "Cyber Security Plan for Nuclear Power Reactors," which was endorsed by the NRC in early 2010 as an acceptable means of meeting the requirements. NEI 08-09 utilizes cyber security controls from the National Institute of Standards and

[4] 10 CFR 73.54, "Protection of digital computer and communication systems and networks."

Technology standards,[5] which are heavily used throughout the U.S. government.

Q. WHAT IS THE STATUS OF THE COMPANY'S EFFORTS TO MEET THE NRC REQUIREMENTS COMMUNICATED TO DATE WITH RESPECT TO CYBER SECURITY?

A. DE Progress submitted its Cyber Security Plan and implementation schedule to the NRC, and received NRC approval. The Company has completed the necessary actions for implementation of the NRC requirements. The activities outlined by the Company within its Cyber Security Plan included examining current practices, developing cyber security program processes, reviewing critical digital assets, performing validation testing, and implementing new controls. The Company's necessary efforts to meet and maintain the NRC's cyber security requirements will place upward pressure on its O&M expense long-term, especially in the areas of labor and maintenance.

Q. ARE THERE CURRENT ISSUES IN THE NUCLEAR INDUSTRY THAT MAY FURTHER IMPACT COSTS FOR CAPITAL AND/OR O&M?

A. Yes. Additional requirements related to Fukushima are possible as the NRC's review efforts are on-going. Additionally, the Environmental Protection Agency (the "EPA") has been developing new and/or stricter regulations

[5] SP 800-53, "Recommended Security Controls for Federal Information Systems," Revision 2 and SP 800-82, "Guide to Industrial Control Systems (ICS) Security," Final Public Draft, September 2008.

regarding, among other things, water intake and cooling functions, which could result in significant impacts on the operational requirements of the Company's nuclear fleet. These key areas of focus will result in added and perhaps significant capital and/or O&M costs.

VI. NUCLEAR OPERATIONAL PERFORMANCE

Q. WHAT ARE DE PROGRESS' OBJECTIVES IN THE OPERATION OF ITS NUCLEAR GENERATION ASSETS?

A. The primary objective of DE Progress' nuclear generation department is to safely provide reliable and cost-effective energy to DE Progress' customers. The Company achieves this objective by focusing on a number of key areas. Operations personnel and other station employees are well-trained and execute their responsibilities to the highest standards in accordance with detailed procedures. The Company maintains station equipment and systems reliably, and ensures timely implementation of work plans and projects that enhance the performance of systems, equipment and personnel. Station refueling and maintenance outages are conducted through the execution of well-planned, well-executed and high-quality work activities, which effectively ready the plant for operation until the next planned outage.

Q. PLEASE DISCUSS THE PERFORMANCE OF THE COMPANY'S NUCLEAR FLEET DURING THE TEST PERIOD.

A. As in years past, DE Progress' nuclear fleet continued to perform well during the Test Period, providing approximately 48% of DE Progress' generation

needs. During 2017, the Company's nuclear plants achieved the second highest output in history, falling just below the record established in 2014. The four nuclear units operated at an actual system average capacity factor of 95.17 percent during the Test Period, which included two refueling outages. The Brunswick station, with annual net generation of just over 15,370 GWHs in 2017, recorded the second-best production in the station's history, falling just below the record established in 2016. The station also established a new record for the longest dual-unit continuous run. During 2017, Harris established a new annual generation record, producing just over 8,208 GWHs.

The performance results discussed above support DE Progress' continued commitment for achieving high performance without compromising safety and reliability.

Q. WHAT INITIATIVES HAS THE COMPANY TAKEN TO INCREASE EFFICIENCIES IN NUCLEAR OPERATIONS?

A. The Company uses benchmarking, long-range planning, work prioritization tools and other processes to continuously improve operational and cost performance. Over the years, the Company has gained efficiencies from the implementation of common policies, practices and procedures across the Duke Energy nuclear fleet. In addition, efficiencies are sought through incorporation of industry best practices. Since the merger, a focused effort remains on improving fleet performance in various areas, and a focus on organizational effectiveness continues identifying and addressing work

improvements. The goal is aligning operations at a fleet level, taking advantage of shared experiences and process improvement opportunities. Overall, improvement efforts result in enhanced fleet reliability and efficiency on a cost per kWh basis.

Q. WHAT CHALLENGES DOES DE PROGRESS FACE REGARDING ITS NUCLEAR OPERATIONS?

A. Despite the success of the Company's efficiency initiatives to mitigate cost increases, DE Progress continues to face upward pressure on O&M costs. A significant challenge facing the nuclear industry is the cost and technological requirements for modernizing systems and equipment within nuclear stations across the country to ensure safe, reliable and economical power that emits zero greenhouse gases. Therefore, maintaining the Company's nuclear assets is critical to achieving significant reductions to current and future levels of greenhouse gas emissions.

Q. HOW DOES THE COMPANY'S NUCLEAR FLEET COMPARE TO OTHERS IN THE INDUSTRY?

A. The Company's nuclear fleet has a history of top performance. The most recently published North American Electric Reliability Council's ("NERC") Generating Unit Statistical Brochure ("NERC Brochure") indicates an average capacity factor of 91.8 percent, for comparable units representing the period 2013 through 2017. The Company's Test Period capacity factor of 95.17 percent exceeds the NERC average of 91.8 percent.

Duke Energy's nuclear fleet continues to rank among the top performers when compared to the seven other large domestic nuclear fleets using Key Performance Indicators ("KPIs") in the areas of personal safety, radiological dose, manual and automatic shutdowns, capacity factor, forced loss rate, industry performance index, and total operating cost. Industry benchmarking efforts are a principal technique used by the Company to ensure best practices. These efforts further ensure overall prudence, safety and reliability of DE Progress' nuclear units.

VII. CONCLUSION

Q. IS THERE ANYTHING YOU WOULD LIKE TO SAY IN CLOSING?

A. Yes. The Company has a proven history of cost competitive operation of its nuclear assets concurrent with maintaining safety, quality, and reliability. DE Progress is positioned to continue as a leader in the industry with a solid base of knowledge and experience, and with a nuclear fleet that is highly efficient and reliable. This base rate increase will allow the Company to continue the tradition of operational excellence and focus on safe operations, reliable generation, and strong performance that ultimately benefits our customers.

Q. DOES THIS CONCLUDE YOUR PRE-FILED DIRECT TESTIMONY?

A. Yes.